WHAT IS CLAIMED IS:

1. A preparation method for low-density rigid polyurethane foam excelling in the flame retardance and the dimensional stability, wherein rigid polyurethane foam having the average value for the ratio of lengthwise direction diameter/cross direction diameter of cells being 1.0 to 1.4 and the density of 20 to 40 kg/m^3 is prepared by combining, as blowing agent, carbon dioxide generated in the reaction between water and polyisocyanate and carbon dioxide under supercritical state, subcritical state or liquid state, and by adding said water and said carbon dioxide under liquid state into said polyol component prior to mixing the polyisocyanate component and the polyol component.

2. The preparation method according to claim 1, wherein the closed-cell content is from 70 to 85% and the water vapor permeance is less than 420 $ng/(m^2 \cdot S \cdot Pa)$ at the thickness of 25 mm.

3. The preparation method according to claim 1, wherein said water is compounded at an amount of 5 to 8 parts by weight to 100 parts by weight of polyol in said polyol component, and said carbon dioxide under liquid state is compounded at an amount of 0.5 to 3 % by weight to the sum of said polyisocyanate component and said polyol component.

4. The preparation method according to claim 1, wherein aromatic polyester polyol is present at an amount of 60 to 90 parts by weight to 100 parts by weight of said polyol.

5. The preparation method according to claim 1, wherein the flame retardant is compounded at an amount of 20 to 40 parts by weight to 100 parts by weight of said polyol.

6. Rigid polyurethane foam obtained by the method according to any one of preceding claims 1 to 5.